

WHAT IS CLAIMED IS

1                   1.       A method for forming a layer on a substrate disposed in a  
2       processing chamber, said method comprising:  
3                   chemisorbing onto said substrate alternating monolayers of a first  
4       compound and a second compound, with said second compound having fluorine atoms  
5       associated therewith, with each of said first and second compounds being introduced into  
6       said processing chamber along with a carrier gas; and  
7                   controlling a quantity of said fluorine atoms associated with the monolayer  
8       of said second compound as a function of said carrier gas.

1                   2.       The method of claim 1 wherein controlling said quantity of said  
2       fluorine atoms further including selecting said carrier gas from a group of gases  
3       consisting of nitrogen (N<sub>2</sub>), argon (Ar), hydrogen (H<sub>2</sub>).

1                   3.       The method as recited in claim 1 wherein said first compound  
2       includes a boron-containing compound.

1                   4.       The method of claim 1 wherein said refractory metal is selected  
2       from the group consisting of titanium (Ti) and tungsten (W).

1                   5.       The method of claim 1 further including purging said processing  
2       chamber following chemisorption of each of the alternating monolayers.

1                   6.       The method as recited in claim 3 wherein purging said processing  
2       chamber includes introducing a purge gas therein.

1                   7.       The method as recited in claim 3 wherein purging said processing  
2       chamber includes pumping said processing chamber to evacuate all gases disposed  
3       therein.

1                   8.       The method as recited in claim 3 wherein purging of said  
2       processing chamber includes introducing a purge gas therein and subsequently pumping  
3       said processing chamber clear of all gases disposed therein.

1                   9.       The method as recited in claim 6 wherein said purge gas and said  
2       carrier gas have identical constituents selected from a group consisting of nitrogen (N<sub>2</sub>),  
3       argon (Ar), hydrogen (H<sub>2</sub>).

1 10. A method for forming a layer on a substrate, said method  
 2 comprising:  
 3 serially exposing said substrate to first and second reactive gases, with said  
 4 first reactive gas having a first compound associated therewith and said second reactive  
 5 gas having a second compound associated therewith, to form alternating monolayers of  
 6 said first compound and said second compound, with said second compound having  
 7 fluorine atoms associated therewith;

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 8 controlling a quantity of said fluorine atoms associated with the monolayer  
 9 of said second compound by introducing into said processing chamber a carrier gas along  
 10 with said first and second reactive gases; and  
 11 purging said processing chamber following chemisorption of each of the  
 12 alternating monolayers.

1 11. The method as recited in claim 10 wherein purging said processing  
 2 chamber includes introducing a purge gas therein.

1 12. The method as recited in claim 11 wherein purging said processing  
 2 chamber includes pumping said processing chamber to evacuate all gases disposed  
 3 therein.

1 13. The method as recited in claim 12 wherein said first compound  
 2 includes a diborane ( $B_2H_6$ ) said second compound is tungsten (W).

1 14. The method as recited in claim 13 wherein said purge gas and said  
 2 carrier gas have identical constituents selected from a group consisting of nitrogen ( $N_2$ ),  
 3 argon (Ar), hydrogen ( $H_2$ ).

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 1 15. A processing system for processing a substrate in a processing  
 2 chamber, said system comprising:  
 3 means for chemisorbing, onto said substrate, alternating monolayers of a  
 4 first compound and a second compound, with said second compound having fluorine  
 5 atoms associated therewith, with each of said first and second compounds being  
 6 introduced into said processing chamber along with a carrier gas; and  
 7 means for controlling a quantity of said fluorine atoms associated with the  
 8 monolayer of said second compound as a function of said carrier gas.

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1 16. A processing system for a substrate, said system comprising:  
2 a body defining a processing chamber;  
3 a holder disposed within said processing chamber to support said substrate;  
4 a gas delivery system in fluid communication with said processing  
5 chamber;  
6 a first temperature control system in thermal communication with said  
7 processing chamber;  
8 a pressure control system in fluid communication with said processing  
9 chamber;  
10 a controller in electrical communication with said gas delivery system,  
11 said temperature control system, and said pressure control system; and  
12 a memory in data communication with said controller, said memory  
13 comprising a computer-readable medium having a computer-readable program embodied  
14 therein, said computer-readable program including a first set of instructions for  
15 controlling said gas delivery system to chemisorb, onto said substrate, alternating  
16 monolayers of a first compound and a second compound, with said second compound  
17 having fluorine atoms associated therewith, with each of said first and second compounds  
18 being introduced into said processing chamber along with a carrier gas, and a second set  
19 of instructions to control said gas delivery system to control a quantity of said fluorine  
20 atoms associated with the monolayer of said second compound controlling a quantity of  
21 said fluorine atoms associated with the monolayer of said second compound by  
22 introducing, into said processing chamber, a carrier gas along with said first and second  
23 reactive gases.

1 17. The processing system as recited in claim 16 wherein said  
2 computer-readable program includes an additional set of instructions to control said gas  
3 system to purge said processing chamber by introducing a purge gas therein following  
4 chemisorption of each of the alternating monolayers.

1 18. The processing system as recited in claim 16 wherein said  
2 computer-readable program includes a further set of instructions to control said pressure  
3 control system to purge said processing chamber by evacuating said processing chamber  
4 following chemisorption of each of the alternating monolayers.

1                    19.    The processing system as recited in claim 16 wherein said  
2 compound includes a boron-containing compound and said second compound includes a  
3 refractory metal compound with said refractory metal compound being from the group  
4 consisting of titanium and tungsten and said purge gas and carrier gases each being from  
5 the group consisting of nitrogen (N<sub>2</sub>), hydrogen (H<sub>2</sub>) and argon (Ar).

1                    20.    The processing system as recited in claim 19 wherein said purge  
2 gas and said carrier gas having differing constituents.

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